



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/609,387	07/03/2000	T. Frank Wang	8229-006-27	3989
7590	03/04/2005			
Steven B Kelber Piper Marbury Rudnick & Wolfe LLP 1200 Nineteenth Street NW Washington, DC 20036-2412			EXAMINER DEO, DUY VU NGUYEN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 03/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/609,387	WANG, T. FRANK	
	Examiner	Art Unit	
	DuyVu n Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15-35 is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☒ Claim(s) 13 and 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 5-7, 10-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Mu et al. (US 4,980,018).

Mu describes a method a semiconductor device comprising: providing a unetched semiconductor device having several layers, at least on of the layers is a refractory metal-containing material such as W (col. 5, line 32-45); etching the semiconductor device with a first etchant having SF₆, Cl₂, He (claimed a chlorine source free of BCl₃ and a fluorine source) (col. 3, line 53-54) and followed by a second etchant comprising Cl₂ and He (claimed etchant which is free of fluorine) (col. 4, line 5).

Referring to claim 12, the flow rates of Cl₂ is about 130 sccm and of He is 50 sccm (col. 8, line 29-32). This would make the Cl₂ concentration is about 72 %, which is within claimed 50-95%.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1765

4. Claims 4, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mu as applied to claims 1, 5, 15, 17 above.

Even though Mu doesn't describe the refractory metal-containing comprise TiW alloy (claim 4). However, he describes that the method can be applied to etch other refractory metals, with minor adjustments in operating parameters (col. 5, line 42-45). Therefore, at the time of the invention, using the method to etch the TiW would have been obvious since W and TiW are used in manufacturing various semiconductor devices (please see page 1 of the specification) with a reasonable expectation of success.

Referring to claim 8, Mu doesn't describe the Cl₂ in the first chemistry is about 50-95%. However, he teaches that the processing parameters including flow rate may be varied and depending the material being etched (col. 5, line 41-45; col. 6, line 13-17). This would show that the parameters in the processing are result-effective variables. Therefore, at the time of the invention, it would have been obvious for one skill in the art to determine the optimum processing parameters including the flow rate or concentration of Cl₂ through routine experimentation in order to etch the refractory material with a reasonable expectation of success.

5. Claims 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mu as applied to claims 5, 15 above, and further in view of Roberts et al. (US 5,626,775).

Referring to claims 9 using other carrier gas such as N₂ is well known to one skill in the art in the art of etching semiconductor device. Roberts shows the carrier gas including He and N

Art Unit: 1765

(col. 5, line 25-26). It would be obvious at the time of the invention, using any of those carrier gas would be equivalent to etch the refractory material with a reasonable expectation of success.

Referring to the processing parameters such as the flow rates of the etching gases in the first and etchants. Mu teaches that the processing parameters including flow rate may be varied and depending the material being etched (col. 5, line 41-45; col. 6, line 13-17). This would show that the parameters in the processing are result-effective variables. Therefore, at the time of the invention, it would have been obvious for one skill in the art to determine the optimum processing parameters including the flow rate or concentration of Cl₂ through routine experimentation in order to etch the refractory material with a reasonable expectation of success.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1-14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicant has not shown where in the specification teaching of providing an unetched semiconductor device.

Art Unit: 1765

Response to Arguments

8. Page 11 may describe the newly-formed refractory metal; however, it doesn't say anything about the substrate or the semiconductor device. Therefore, the specification doesn't have support for "providing an unetched semiconductor device."

Referring to applicant's argument that Mu's first etchant, which contains no Cl₂, would corresponding to claim 1st etchant is found unpersuasive because the claim uses "comprising" language, which means it doesn't limit to just the 2 etchants cited in the claim. It can comprises other etchants. Furthermore, there is nothing that would suggest Mu's first etchant corresponds to claimed first etchant. Any etchant that comes before another etchant would read on claimed first etchant.

Referring to applicant's argument that Roberts uses completely different etchants than Mu and Kugimiya is acknowledged. However, he shows that as a carrier gas, either He or N₂, can be used. Therefore, at the time of the invention, using either He or N₂ as a carrier gas would be equivalent and obvious to one skilled in the art.

The rejection of claims 13-35 under Mu and Kugimiya has been withdrawn because Mu doesn't suggest any range for the bias and he uses a different apparatus from Kugimiya's apparatus.

Allowable Subject Matter

9. Claims 13-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Art Unit: 1765

Claims 13-14 are allow for the reason explained in the last paragraph in the Respond to Argument section.

10. Claims 15-35 are allowed for the same as as claims 13-14.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-3:30; with alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1765

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DVD

3/3/05

A handwritten signature, possibly "G. J.", is written below the date.